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Extern host site: REG

Part I: Overview of Business

Renewable Energy Group (REG) is the largest producer of advanced biodiesel in North America. They also produce biodiesel internationally and develop renewable chemicals. Biodiesel is unique because it can be made from renewable sources such as waste oils and byproducts that already exist above ground. This helps to protect the environment, create more markets for farmers, and decrease our dependence on foreign oil. That's a win, win, win situation!

Part II: Job Specifics

I worked in the chemistry lab at REG. They are always striving to uphold quality standards for the biodiesel they produce, as well as continuing to strive to create new and better products. Most of the time in the lab is spent either testing samples that the biodiesel plants send in to make sure they meet quality standards, or testing new "feedstocks" to see if they would be viable oil sources from which to make biodiesel.

Part III: Introduce the Problem

When making biodiesel, many factors must be considered. Many different "feedstocks", or starting materials, can be used to create biodiesel, such as waste oils from restaurants, vegetable oils, or animal fats. Each one comes with a different cost to acquire it and results in slightly different properties in the end product. A problem that must continually be evaluated is how to make the best possible product at the lowest reasonable price.

Part IV: Background

One important factor to consider when making biodiesel is its "cloud point". This is the temperature at which the fuel will gel and cause distribution and usage difficulties. This is a very important consideration for people in cold climates. One thing that influences cloud point is the feedstock used to make the biodiesel. Say, for instance, that biodiesel made from beef tallow was fairly inexpensive to make, but had a cloud point of 59°F (15°C). That fuel could not be used in the winter season in Northern regions. Biodiesel made from soybean oil, on the other hand, has a cloud point closer to 34°F (1°C), but is more expensive to make. Traditional petroleum diesel can have a cloud point as low as -40°F (-40°C). Create an experiment to determine how to blend any two of the above fuels to create an end product containing the highest possible amount of biodiesel at the best price that has a cloud point of 0°F (-17°C).

Part V: Business Solution

The lab has a machine that can test cloud point of biodiesel. They would make several blends of the Biodiesel options with the petroleum diesel and then test them on the machine to find which blend has the desired cloud point.

Part VI: Student Solutions

I think the students would figure out to make serial dilutions of traditional petroleum diesel with each of the biodiesel options. They could then use water baths or freezers to chill the blends down to colder temperatures and observe when the ice crystals forming creates a cloudy appearance. Then they could determine what the maximum amount of biodiesel could be to create a blend with a cloud point of 0°F (-17°C). They could also look up price per gallon of the two biodiesel options and do a cost analysis.